Knitting Machine KH-588

SERVICE MANUAL

BROTHER

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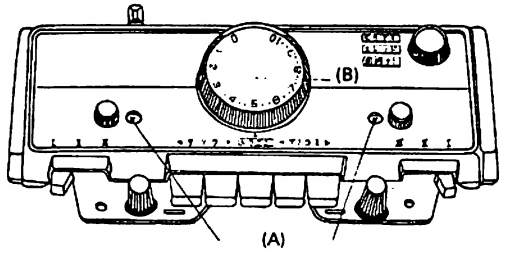
■CHECK-LIST OF PROBLEMS FOR KH-588

PROBLEM	MAIN CAUSES	SOLUTION
Carriage		
Carriage slows down.	(1) The moving part of the carriage needs oiling. (2) The moving part of the needle bed needs oiling. (3) End play of the carriage is too small. (4) The gate pegs are in contact with the sinker plate. (5) The needle butts need oiling. (6) The wool is not flowing freely.	See Page 19 〃
Stitches float or tuck.	(1) Latch of the needles fail to work properly. (2) Clearance between the sinker plate and gate pegs is too wide. (3) Selvedges are too wide or too coarse.	See Page 19
Unintended stripes are formed every two rows.	(1) The thread pulling distance of the right stitch cam differs from that of the left stitch cam.	See Page 18
Stripes appear here and there or stitches look bad	(1) End play of the carriage is too wide. (2) Carriage speed is not uniform. (3) Thread fails to be fed smoothly.	See Page 19
Machine body		
Return button fails to return to its original position when pressed, or the needle selector button is difficult to depress.	(1) Needle pusher holder is oilstained. (2) Needle pusher fails to work properly. (3) Reverse lever spring is distorted.	See Page 14 〃 See Page 16
Right and left selvedges are different in length.	(1) Gate peg unit is not installed properly.	See Page 13
Carriage is jammed while the machine is in operation.	(1) Needle bed has a crack. (2) Butts of the needle are cracked. (3) Butts of needle require oil.	
Stitches drop in Multi-colored pattern	(1) Latch of the needles at Position D is closed. (2) Carriage speed is too fast.	
L carriage		
L carriage is jammed while sliding, so it fails to work.	(1) Selvedges are too fine. (2) L carriage was used while being lifted. (3) The needles are not in a line.	
Stitches drop.	(1) Latch of the needle fails to work properly. (2) Gate pegs are bent. (3) Position of the forwarding claw is not appropriate. (4) Position of the cams is not appropriate. (5) Position of the leaf spring is not appropriate. (6) Sinker plate is distorted.	See Page 21 or 22 〃 〃 〃 〃 〃
Stitches are hooked on the gate pegs.	(1) Selvedges are too coarse. (2) Yarn is not fed smoothly. (3) Operating speed is too fast. (4) Gate pegs are bent.	

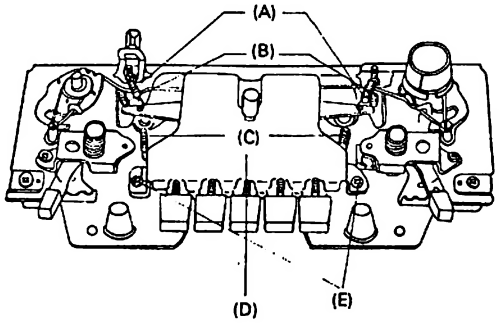
■DISASSEMBLING OF THE CARRIAGE

●Removal of the carriage cover:



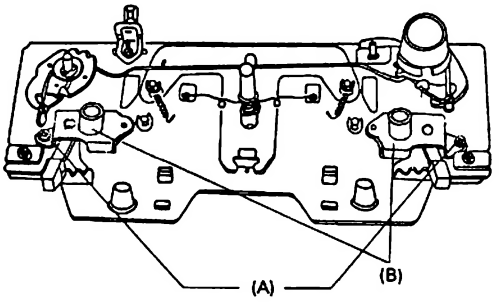
1. Remove two carriage cover fastening screws (A) and then lift the carriage cover to remove.
2. Pull the tension dial (B) up to remove.

●Removal of the pattern selector button unit:



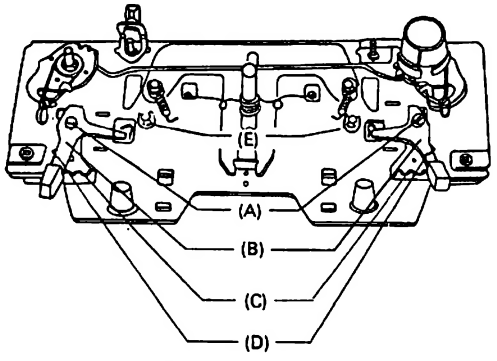
1. Remove the right and left raiser cam pull springs (A) from the rear leg fastening screws.
2. Disconnect the end of the raiser cam shift springs (B) on the side of the pins with a latch tool.
3. Disconnect the end of the right and left stitch cam plate pull springs (C) each on the side of the pattern selector button unit (D) with a latch tool.
4. Remove the right and left pattern selector-button-unit fastening screws (E).
5. Pull the unit toward yourself, then lift and remove.

●Removal of the right and left handle-fitting-screw-holders:



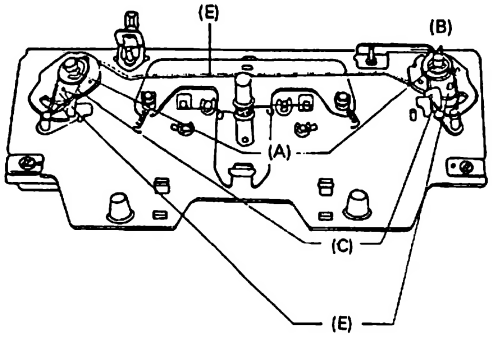
1. Remove the right and left handle-fitting-screw-holder fastening screws (A).
   Note: Be carefull to keep the screw-head of these two screws (A) at removing them, because they are fastened very tightly.
2. Move the right handle-fitting screw holder (B) to the right and lift it to remove.
3. Move the left handle-fitting screw holder (B) to the left and lift it to remove.

●Removal of the holding cam levers:
●Removal of the holding cams:



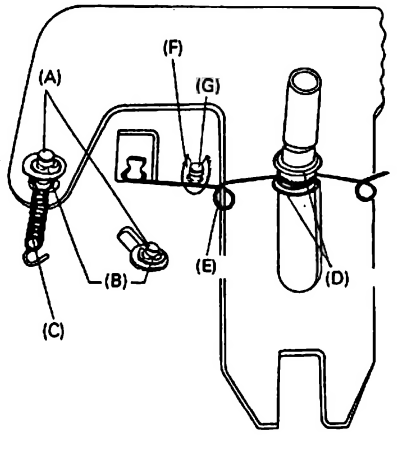
1. Remove the right holding cam lever fastening screw (A).
   1-1. The holding cam lever (B), holding cam lever holder (C) and holding cam spring (D) all together can be removed concurrently.
2. Remove the left holding cam lever fastening screw (A).
   2-1. The same as in the case of the right holding cam lever fastening screw.
3. Remove the right and left U-shaped stopper rings type 4 (E) with a small wrench.
   3-1. Remove the holding cams.

●Removal of the MC knob:
●Removal of the switch cams:



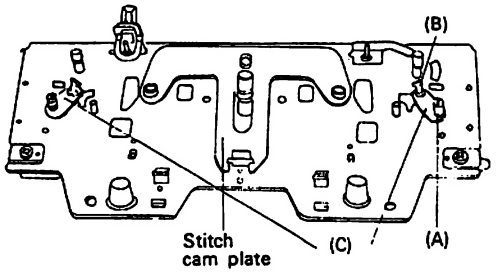
1. After shifting to the "MC" position, pull out the MC knob.
2. Remove the right and left switch cams E-shaped stopper rings type 5 (A) with a small wrench, then washers 405325 (B).
3. Remove the right and left "MC" cam springs (C).
4. When the right and left switch cams (D) are pulled out, move the switch cam connecting wire (E) concurrently.

●Removal of the stitch cams:
●Removal of the tuck cams:



1. Remove the right stitch cam axle (A) and the right stitch cam pin E-shaped stopper ring type 3 (B) and the right stitch cam plate spring (C) will be removed to cause the right stitch cam to drop.
2. The left stitch cam can be removed as above.
3. Remove the washer 405516 (D) and then the tuck cam spring (E) from the tuck cam axle (G).
4. Remove the right and left U-shaped stopper rings type 4 (F) from the tuck cam pins with a small wrench.
5. If the U-shaped stopper rings type 4 are removed, the tuck cams and guide cams will be removed concurrently.

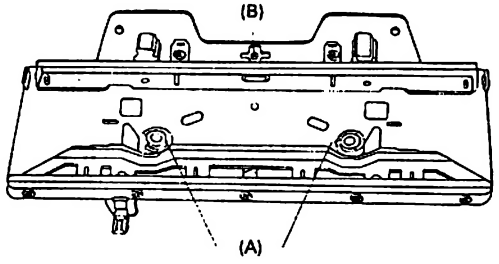
Removal of the "MC" cams:

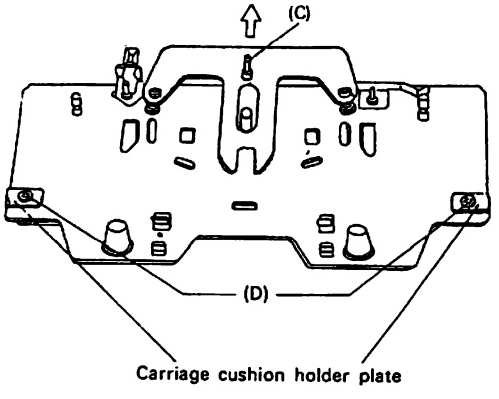


1. Loosen the right "MC" cam axle (A) with a wrench to be removed.
   (Note: The cam axle is fastened tight so that care should be exercised not to let wrench slip.)
2. Loosen the left "MC" cam axle (A) with wrench and remove.
3. Then, the "MC" cam (B), "MC" cam presser plate (C) and "MC" cam axle collar all together with be removed concurrently.

●Removal of the stitch cam plate:

●Removal of the front leg of the carriage:

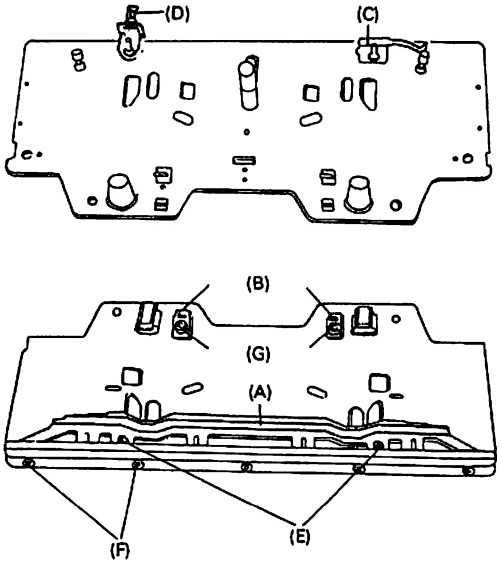




1. Remove the right and left E-shaped stopper rings type 7 (A) from the back side of the carriage plate.
2. Remove the stripe adjusting plate (B).
3. Lift the stitch cam plate pin (C) and move the cam plate in the direction of an arrow to remove.
4. Remove the right and left carriage cushion holder plate fastening screws (D) and the front leg of the

●**Removal of the carriage rear leg (A):**

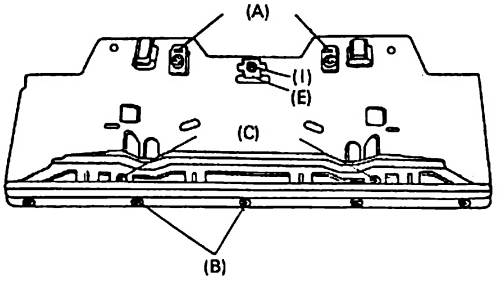
●**Removal of the sinker plate stoppers (B):**



1. Remove the "MC" knob spring fastening nut with a box wrench. (The "MC" knob spring (C) can be pulled out)
2. Remove the row indicator spring fastening nut with a box wrench. (The row counter tripper (D) can be pulled out.)
3. Remove the right and left carriage rear leg fastening screws (E) from the back of the carriage.
4. Remove five carriage rear leg stopper screws (F). (The rear rail can be removed.)
5. Remove the right and left sinker plate stopper fastening screws (G).

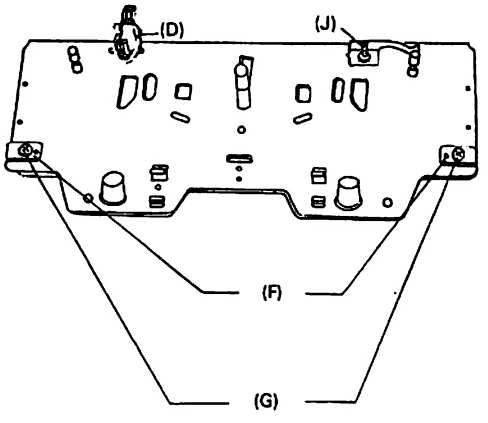
ASSEMBLING OF THE CARRIAGE

●Fitting of the sinker plate stoppers:
●Fitting of the carriage rear leg:



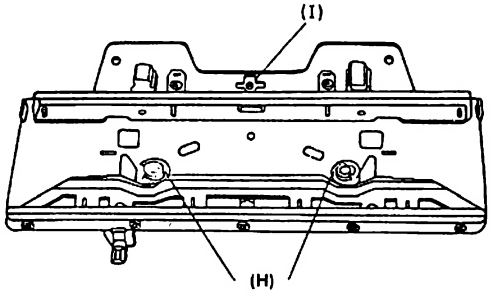
1. Fit the right and left stoppers (A).
2. Fit the carriage rear leg with the rear leg nuts to be fitted onto the carriage plate.
3. Fasten the five rear leg stopper screws (B). (The carriage rear leg should be adhered to the inside of the carriage.)
4. Fasten the right and left carriage rear leg fastening screws (C) from the back side of the carriage plate.
5. Place the carriage plate face up and fasten the row counter tripper (D) on the left side and the "MC" knob spring (J) on the right side tightly with nuts. (The row counter tripper should be installed so as to be able to work properly.)

●Fitting of the carriage front leg:



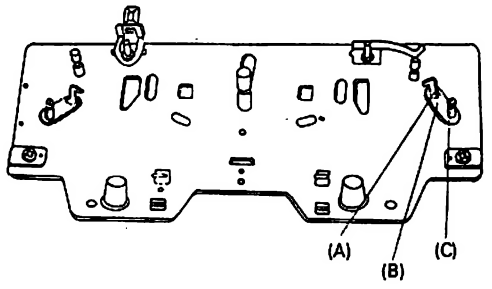
1. Insert the stripe adjusting plate (E) under the carriage front rail and place the right and left carriage cushion holder plates (F) on top of it, then fasten the right and left carriage cushion fastening screws (G) lightly.

●Fitting of the stitch cam plate:



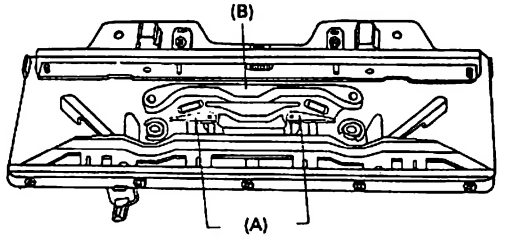
1. Fit the stitch cam plate onto the carriage plate and insert the washer 405483 from the back side of the plate, then fix its right and left sides with the E-shaped stopper rings type 7 (H).
2. Fasten the stripe adjusting plate fastening screw (I) lightly. (Make sure that the lowering cam plate moves back and forth smoothly.)

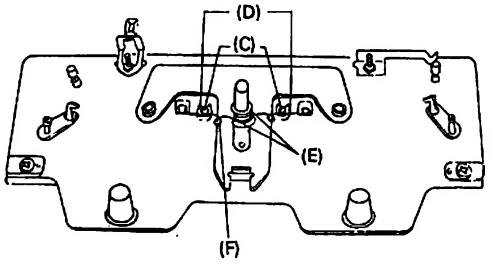
●Fitting of the "MC" cams:



1. Insert the right "MC" cam (A) from under the carriage plate and the "MC" cam axle collar from above, then put the cutting groove on the "MC" cam presser plate (B) into the "MC" cam to fasten with the "MC" cam axle (C) securely.
2. Fit the left "MC" cam in the same way as in the above.
3. Make sure that the "MC" cam works properly.

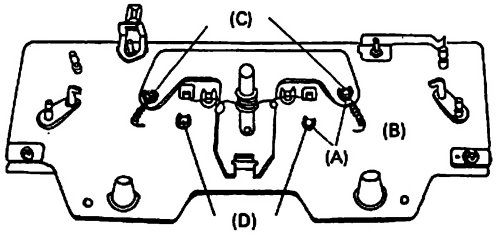
●Fitting of the tuck cams:





1. Put the right and left tuck cams (A) into the guide cam (B).
2. Fit the guide cam together with the tuck cams from the back side of the carriage plate and the tuck cam pins (C) from the front side to be fixed with the U-shaped stopper rings type 4 (D). (Care should be exercised not to spoil the head of the tuck cam axles.)
3. Put the washers 405561 (E) on the tension dial axle and hang the tuck cam spring (F) in such a way as shown in the figure at left. (Be careful not to take the wrong direction of the tuck cam spring and make sure that the tuck cams move smoothly.)

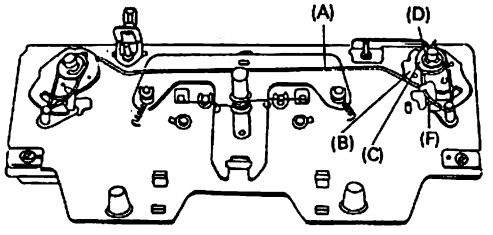
●Fitting of the stitch cams:



1. Fit the right stitch cam from the back side of the carriage plate.
2. Place washer 403387 on the lowering cam pins (D) from above to be fixed with the E-shaped stopper rings type 3 (A).
3. Put the stitch cam plate pull spring (B) on the stitch cam axle (C) and place the washer 403387 to be fixed with the E-shaped stopper ring type 3. (The stitch cam plate pull spring shall be fitted so as to make its hook-shaped end face inside.)
4. Fit the left stitch cam in the same way as in the case of the right stitch cam.

Fitting of the switch cams:

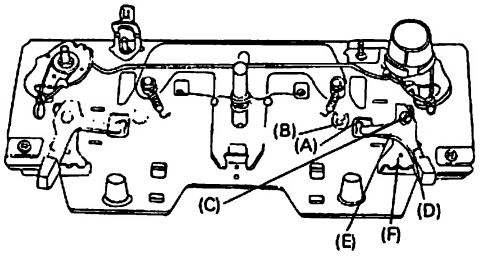
●Fitting of the "MC" knob:



1. Put the switch cam connecting wire (A) into the right and left switch cams (B).
2. Set the switch cams at the "MC" position and fit both right and left cams at the same time.
3. Fit the "MC" cam spring (F).
4. Put on the washer 405325 (C) and fix with the E-shaped stopper ring type 5 (D).
5. Put on the "MC" knob from above. (Make sure that the "MC" knob moves lightly and works to make the "MC" cams shift without fail.)

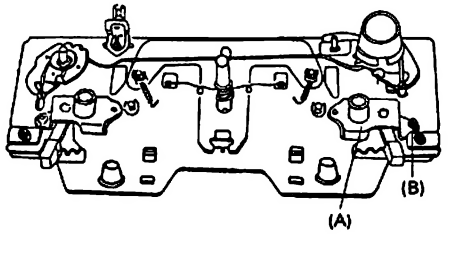
●Fitting of the holding cams:

●Fitting of the holding cam levers:



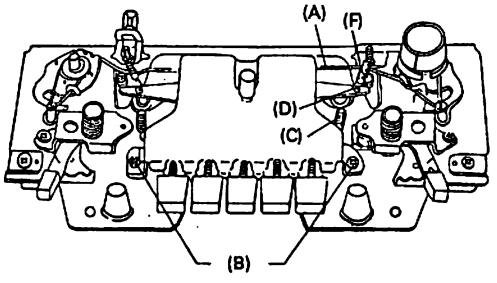
1. Fit the right holding cam (A) from the back side of the carriage plate.
2. Fix the holding cam with the U-shaped stopper ring type 4 (B) from the front side of the carriage plate.
3. Put the holding cam lever axle screw (C) into the right holding cam lever (E) and put on the right holding cam spring (D) to be connected with the holding cam lever holder (F) and fastened with the holding cam lever axle screw (C).
   (Note: The holding cam lever should be fitted on the side of the holding cam.)
4. Fit the left holding cam and left holding cam lever in the same way as in the above.
5. Hang the hook-shaped section of the holding cam spring on the holding cam lever and its straight section on the holding cam.

●Fitting of the handle-fitting-screw-holders:



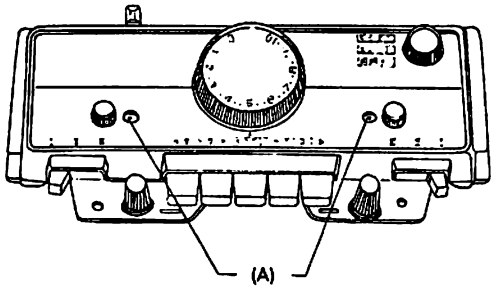
1. Fit the right handle fitting screw holder (A) and fix with the handle fitting screw holder fastening screw (B).
2. Fit the left handle fitting screw holder in the same way as in the above.

Fitting of the pattern selector button unit:



1. Place the washer 405516 on the tuck cam spring correctly. (Be careful not to let the washer incline.)
2. Fit the pattern selector button unit by pushing the "MC" cam connecting wire (A) toward yourself with a finger so as to put it inside the unit and fasten with the unit fitting screw (B).
3. Hang the right and left stitch cam plate pull springs (C) on the unit.
4. Hang the right and left raiser cam shift springs (D) on the raiser cam pins.
5. Hang the hook section of the right and left raiser cam pull springs (F) on the raiser cam shift and their round section on the carriage rear leg spring. (Make sure that when the pattern selector buttons are depressed to shift to the TUCK, PLAIN or PART position, the appropriate cam is shifted correctly.)
6. Put the tension dial into the dial hole so as to make the middle between graduations 1 and 10 position set on the side of the PLAIN button and fit it by turning it clockwise while pushing it from above.
7. Adjust the leg width of the carriage by referring to "How to adjust the carriage front leg on a later page.

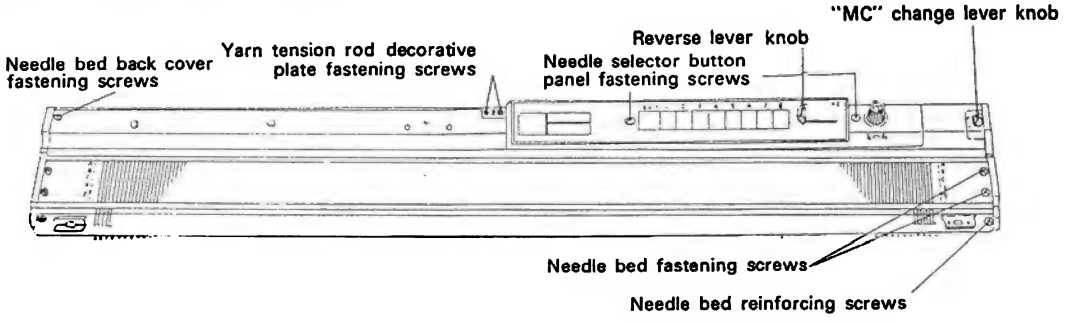
●Fitting of the carriage cover:

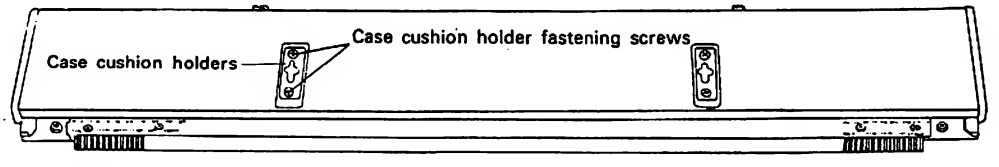


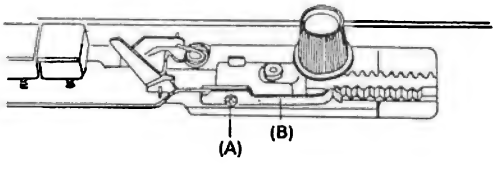
1. Fit the carriage cover and fasten with the carriage cover screws (A).

■DISASSEMBLING OF THE MACHINE BODY

●**Take the machine body from the case.**

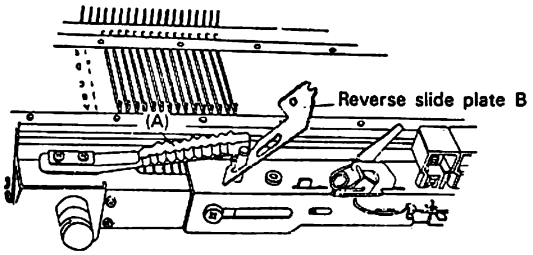

"MC" change lever knob
Reverse lever knob
Yarn tension rod decorative plate fastening screws
Needle bed back cover fastening screws
Needle selector button panel fastening screws
Needle bed fastening screws
Needle bed reinforcing screws

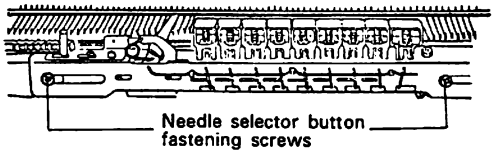




1. Pull out the reverse lever knob.
2. Pull out the "MC" change lever knob.
3. Remove the right and left needle selector button panel fastening screws to remove the panel.
4. Remove the slide dial.
5. Remove the right and left yarn tension rod decorative plate fastening screws.
6. Remove the right and left needle bed back cover fastening screws.
7. Remove the four needle bed fastening screws.
8. Remove the right and left needle bed reinforcing screws.
9. Remove the slide stopper spring fastening screw (A) to disconnect the slide stopper spring (B).
10. Move the needle bed back cover to the left to remove.
11. Turn the machine body upside down and remove the four case cushion holder fastening screws.
12. Take the machine body from the case.

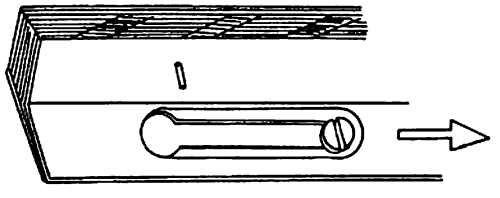
●Removal of the needle selector button unit:





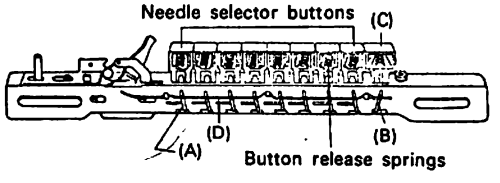
1. Remove the reverse slide plate B in such a way as shown in the figure at left. (This can be done easily by lifting the rack gear (A) slightly by hand.)
2. After removing the right and left needle selector button unit fastening screws, remove the unit by pulling it gradually toward yourself.

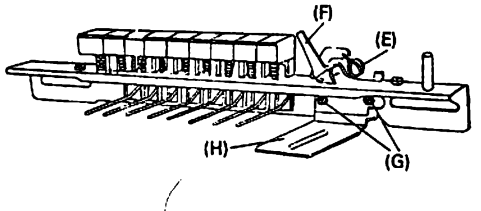
●Removal of the needle pusher holder:



1. After the needle selector button unit was removed, pull out all needles to the E position and then move the needle pusher holder in the direction of arrow, then remove.

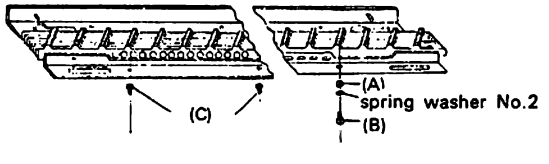
●Disassembling of the needle selector button unit:





1. Remove the push button crank stopper wire (D).
2. Pull out one release button crank (B). (The release button (C) will be removed.)
3. Pull out eight needle selector button cranks (A). (The needle selector buttons 1 to 8 can be removed.)
4. Remove the reverse cam spring (E). (The reverse cam assembly (F) can be removed.)
5. Remove the right and left reverse slide plate guide pin fastening nuts (G). (The reverse slide plate A (H) can be removed.)

●Disassembling of the needle pusher holder:

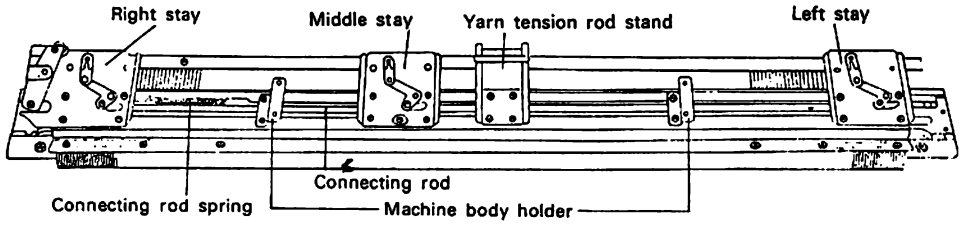


1. Remove four needle pusher holder fastening screws (C).
2. Remove the needle pusher holder guide pin (B) & fastening nut (A).

●**Removal of the right and left machine body holders:**

●**Removal of the yarn tension rod stand:**

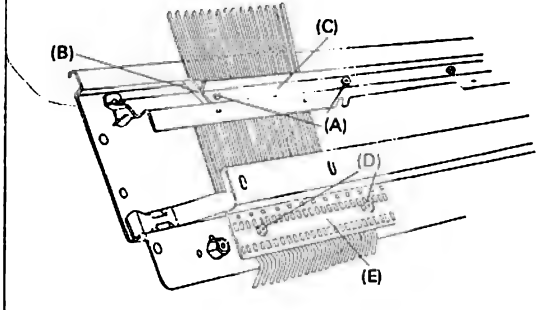
●**Removal of the right, middle and left stays:**



1. Remove both two right and left machine holder fastening screws.
2. Remove four yarn tension rod stard fastening screws.
3. Remove connecting rod spring.
4. Remove 12 right, middle and left stay fastening screws.
   4-1. The right and left sponge ber guides and the right, middle and left stay assemblies will be removed concurrently.)
5. Remove the connecting rod fastening screw of the right, middle and left stays.
   5-1. The right, middle and left stays and the connecting rod both can be disassembled.

●**Removal of the needle retaining spring:**

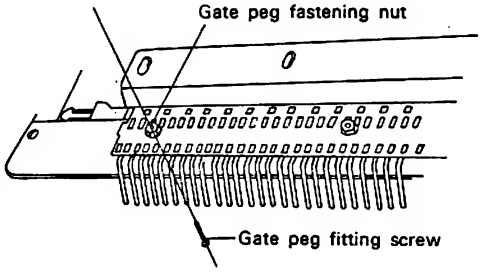
●**Removal of the gate peg assembly:**

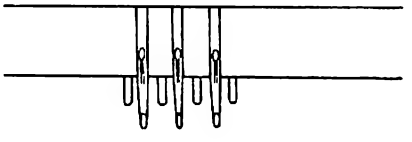


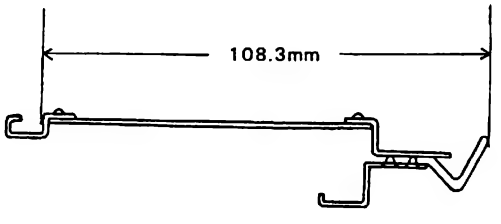
1. Remove 10 needle retaining spring fastening screws (A) with a small wrench.
2. Then, the needle retaining spring (B) and the spring holder (C) can be removed.
3. Remove 12 gate peg fastening nuts (D) with a box wrench.
4. Then, the gate peg assembly (E) can be removed.

ASSEMBLING OF THE MACHINE BODY

●**Fitting and adjustment of the gate pegs:**







Model	Distance
KH311~KH551	107.5 mm
KH561~KH571	106.5 mm
KH581	106.8 mm
KH583~KH588	108.3 mm

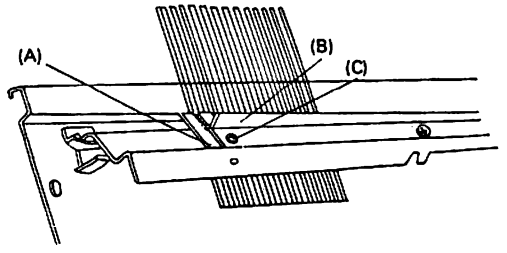
1. Fasten 12 gate peg set position screws and gate peg fastening nuts lightly.
2. Pull out three needles at both ends and in the center of the needle bed each and set the position of the gate pegs so as to locate each of three such needle in the center between two adjacent gate pegs, or a little bit left from the center.
3. After setting the distance of gate peg fitting at 108.3 mm, fasten the gate peg fastening nuts tightly.

   Note: The distance of gate peg fitting should be adjusted with a slide caliper or a gate peg adjusting tool and the gate pegs fastened with nuts. Be careful not to fasten them so tightly that the screws are damaged.
4. The distance of gate peg fitting for old models is shown in the following table.

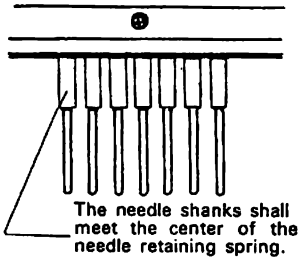
●**Fitting of the needle retaining spring:**

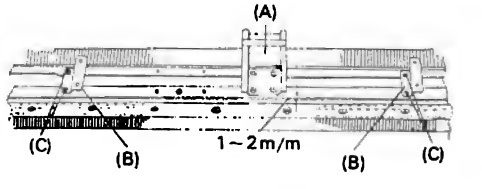
●**Fitting of the machine body holders:**

●**Fitting of the yarn tension rod stand:**



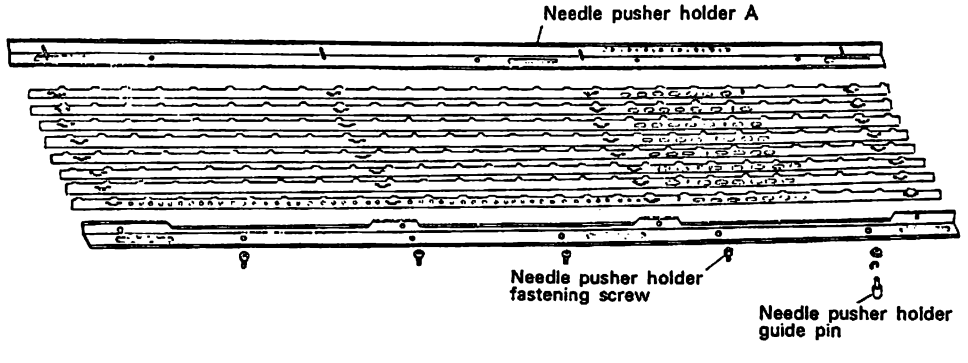
1. Place the needle retaining spring (A) and spring holder (B) on the plate and fasten 10 needle retaining spring fastening screws (C) lightly with a small wrench.
2. Adjust the position of the needle retaining spring so as to locate the needle shanks in the center of the spring and then fasten the screws tightly.

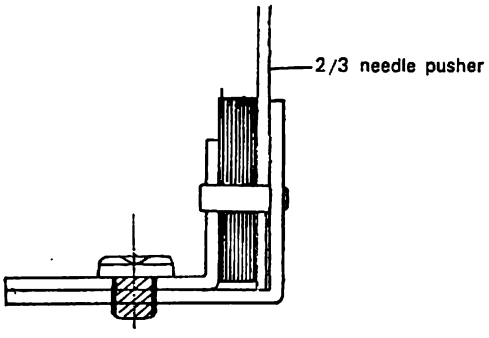




3. Fasten four yarn tension rod stand fastening screws lightly. In this case, fix the yarn tension rod stand assembly (A) 1-2 mm from the side of the gate peg holder and fasten with the fastening screws. (Be careful not to fit the assembly crookedly.)
4. Fasten the right and left machine body holders (B) with two fastening screws (C).

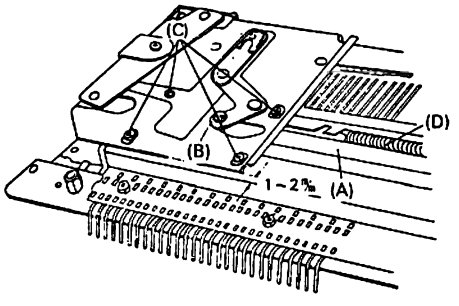
●**Assembling of the needle pusher holders:**





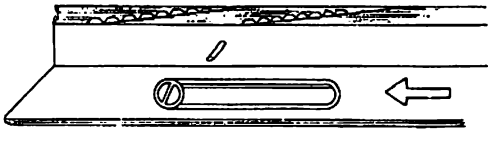
1. Connect eight needle pushers (from the one with the crank hole at the extreme right) with the needle pusher holder A in order and cover with the needle pusher holder B, then fasten four holder fastening screws and one holder guide pin lightly.
2. Insert 2/3 needle pusher into the holder and fasten screws tightly. (Appropriate clearance should be made in the holder so that all individual needle pushers can move slightly.)

●Fitting of the right, middle and left stay assemblies:



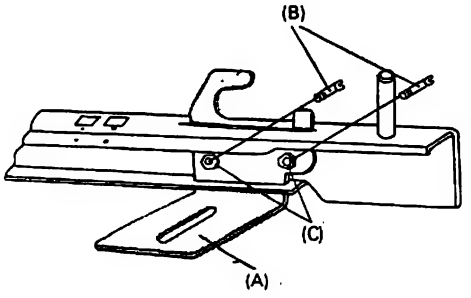
1. Connect the right, middle and left stay assemblies each to the connecting rod (A) with connecting rod fastening screws (B).
2. When together with the connecting rod, the right, middle and left stays are fitted on the machine body, attach the sponge bar guide under them and fasten stay fastening screws (C) lightly. On this occasion, position them correctly 1-2 mm from the side of the gate peg holder.
3. Fit the connecting rod spring (D).

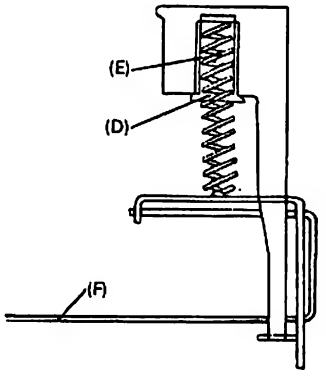
●Fitting of the needle pusher holders:

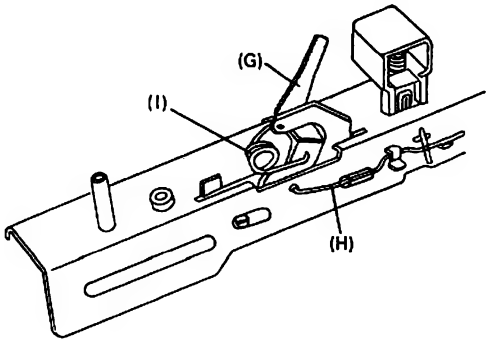


1. Pull out the needles to the position DI and put up the needle pusher holder guide screws from under the holder to be inserted into each of the three round holes and move the holder in the direction of arrow.

●Assembling of the needle selector button unit:

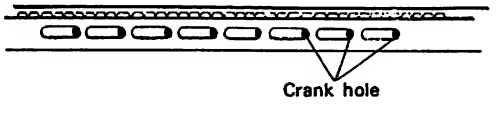




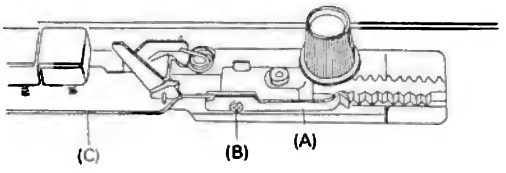


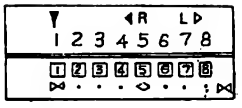
1. Connect the reverse slide plate A (A) to the needle selector button unit frame and fasten two reverse slide plate guide pins (B) with nuts (C).
2. While supporting the needle selector button return plate from inside the frame, connect the needle selector button spring holder (D) and needle selector button return spring (E) to the needle selector button and insert the combination from above the unit, then the return button crank (F).
3. Thus, insert all the needle selector buttons 1-8 each connected with the button return spring and button spring holder from above the unit.
4. Bring the reverse slide plate A closer to the side of the needle selector button and fit the reverse cam (G).
5. Fit the push button crank stopper wire (H).
6. Fit the reverse cam spring (I).

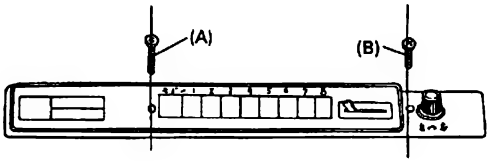
●Fitting of the needle selector button unit:



● **Placing of machine body into the case:**



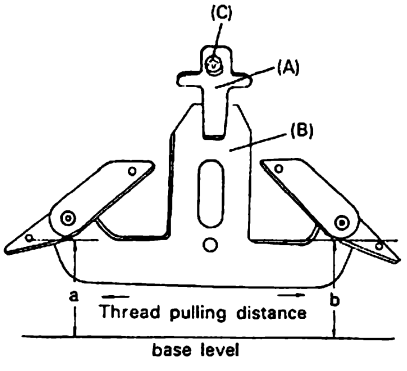


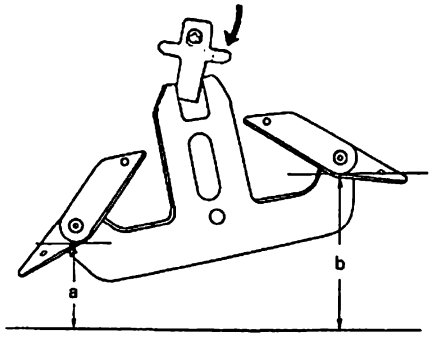


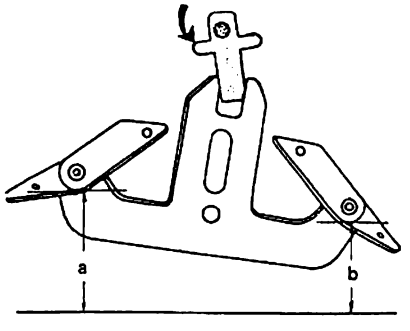
1. Place the machine into the case.
2. Fasten four right and left needle bed fastening screws.
3. Put the needle bed back cover from the left side and fasten it with the right and left fastening screws.
4. Fasten the right and left fastening screws to fit the yarn tension rod decorative plate.
5. Fasten the yarn tension rod decorative plate with the right and left fastening screws.
6. Fit the slide stopper spring (A) and fasten with the slide stopper spring fastening screw (B) lightly.
7. Link the slide indicating rod (C) with the slide meter and hang the hook-shaped section of the rod on the slide stopper spring fastening screw.
8. Put the slide dial on the dial axle and stop the dial on graduation 1.
9. Move the slide indicating rod until graduation 1 on the slide meter and the mark ▼ coincide with each other, then fasten with slide stopper spring fastening screw.
10. Fit the needle selector button panel to be fastened with two fastening screws.
    Note: The left needle selector button panel fastening screw (A) is longer than the right one (B).
11. Fit the reverse knob.
12. Fit the "MC" change lever knob.
13. Reverse the machine body and fit the case cushion rubber and cushion holder.
    Note: The case cushion holder shall be fitted so as to make its large grooved section placed on the side of the gate pegs.

HOW TO ADJUST INDIVIDUAL PARTS

●How to adjust stripes:



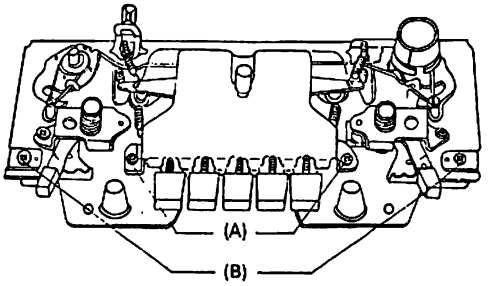




The stripe adjusting plate (A) is linked with the stitch cam plate (B) which in turn is linked with the right and left stitch cams.

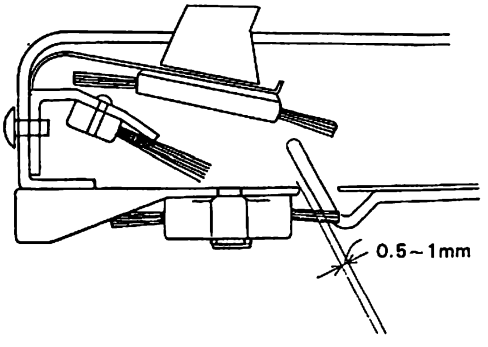
1. Loosen the stripe adjusting plate fastening screw (C) and push the right side of the stripe adjusting plate and the stitch cam plate will slant to the left so that the left stitch cam goes down (the distance (a) gets smaller) while the right stitch cam goes up (the distance (b) gets larger).
2. Push the left side of the stripe adjusting plate and the stitch cam plate will slant to the right so that the right stitch cam goes down (the distance (b) gets smaller while the left lowering cam goes up (the distance (a) gets larger).
3. Adjust the stripe adjusting plate to make the thread pulling distance of the right and left stitch cams (the distances a and b) uniform at a given distance and fasten with the stripe adjusting plate fastening screw.
4. After the adjustment of the stripe adjusting plate, don't fail to knit with 4-ply yarn by setting the tension dial at graduation 5 to make sure that the thread pulling distance of the right and left stitch cams each is the same.

●How to adjust the carriage front leg:



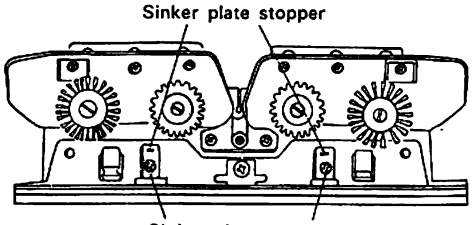
1. Remove the carriage cover.
2. Fit the carriage into the needle bed.
3. Loosen the right and left fastening screws (A) of the pattern selector button unit.
4. Loosen the right and left fastening screws (B) of the carriage cushion holder, too.
5. Adjust clearance between the carriage and needle bed to less than 0.5 mm in three places --the right end, center and left end of the needle bed-- and fasten the right and left fastening screws of the carriage cushion holder.
6. Fasten the right and left pattern selector button unit fastening screws.
7. Fit the carriage cover.

●How to adjust the sinker plate:



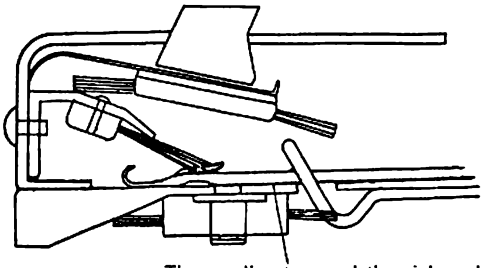
(Adjustment of lengthwise gap)

1. Loosen the sinker plate stopper fastening screws.
2. Fix the carriage on the needle bed and fit the sinker plate.
3. Adjust clearance between the sinker plate and gate pegs to less than 0.5-1 mm and fasten the sinker plate thumb screws.
4. Remove the carriage from the needle bed carefully.
5. Put the tip of the sinker plate stopper into the long groove of the sinker plate and tighten the right and left fastening screws.
6. Return the carriage into the needle bed and remove the sinker plate, then refit it to make sure that the sinker plate is adjusted correctly.



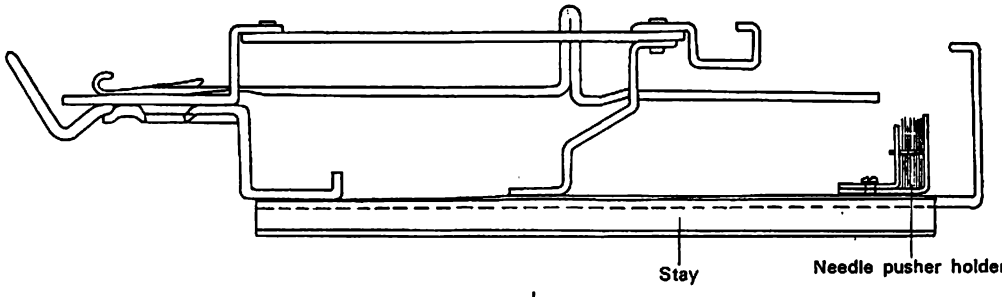
(Adjustment of height.)

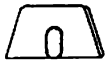
1. Put the carriage onto the needle bed and set both right and left holding cam levers at Ⅲ.
2. Pull out five needles to position E in three places --the right end, middle and left end of the needle bed--.
3. Bend the sinker plate slightly to reduce clearance between the stem of needles and sinker plate to zero.



The needle stem and the sinker plate are slightly in contact with each other.

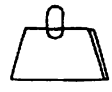
●How to adjust the wrong needle selector button action:




Wrong

Normal

Normal


Wrong

◎Even when the button is not pressed, the needles can be selected.

◎The needles at the position A can be selected.

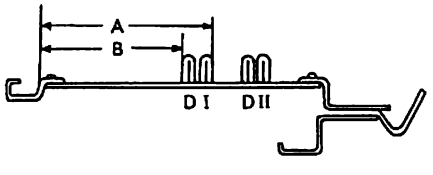
• Trouble caused by the too high position of the needle pusher holder.

1. Take the machine from the case and bend three places where the pusher holder is supported-- the right, middle and left stays-- to such an extent that the pusher holder won't have to move back and forth slowly.
   1-1. In bending the stays, keep in mind that if they are bent in one place intensively, it will cause the pusher holder to work poorly.
2. Make sure that the pushers and needles meet at the proper position.
   2-1. Although it is preferable that the surface of the needle pushers and the needle shanks coincide with each other, it doesn't matter even if the needle shanks come out about 3/7 from the needle pushers.

●How to adjust the needle selection position:

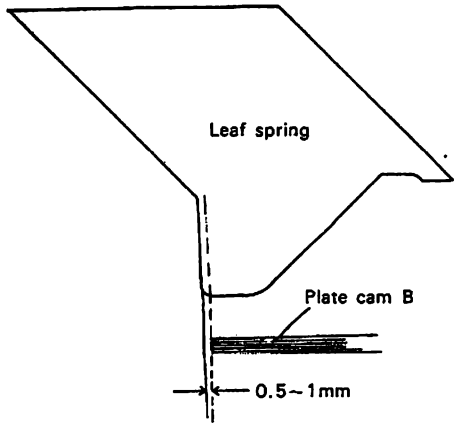
"MC" change lever

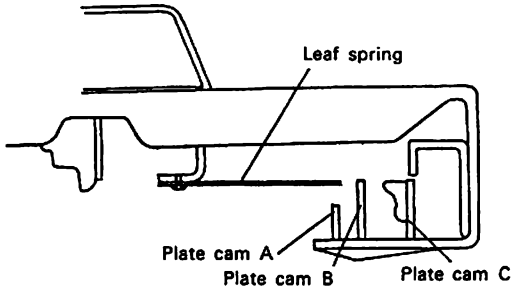
	Needle selection position	Needle selector button 1 (A)	Needle selector button 8 (B)
△	D I	Less than 45.3 mm	More than 37.0 mm
▼	D II	Less than 54.3 mm	More than 46.0 mm

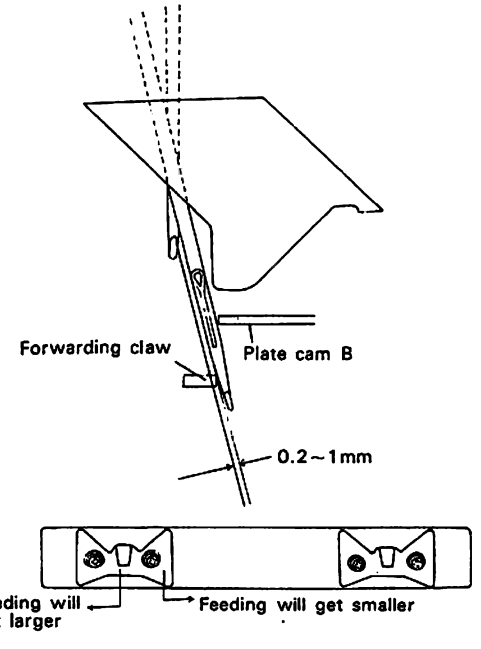


1. When the needle selection position is different from the figures shown at left, loosen the needle pusher holder fastening screw and adjust the position by moving the connecting crank vertically.

●**How to adjust stich dropping in lace knitting:**



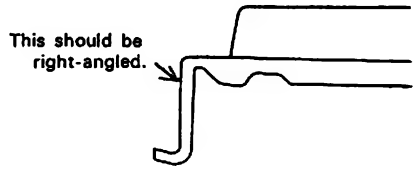


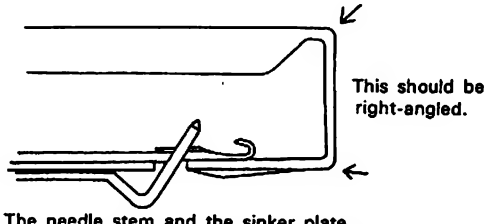


Inspection and adjustment shall be made in the following manner.

1. Adjustment sideways of the left spring.
   a) After removing L carriage cover, loosen the right and left fastening screws of the leaf spring.
   b) Position the leaf spring within 0.5 to 1 mm from the cross section of the plate cam on the basis of the plate cam B as shown in the figure at left and then tighten the fastening screws.
2. Vertical adjustment of the position of the leaf spring.
   a) Adjust the position of the leaf spring so that the tip of the leaf spring is on the same level as the height of the plate cam B.
   b) In adjusting the position of the leaf spring, you may use a punch or lever, but you must avoid bending the leaf spring locally.
3. Adjustment of the forwarding claw.
   a) The forwarding claw is fixed with the forwarding claw fastening screws on the side of the sinker plate.
   b) Loosen the forwarding claw fastening screws and move the position of the claw inside and the amount of feeding will get smaller.
   Move the position of the claw outside and the amount of feeding will get larger.
   c) Adjust the clearance between the closed needles and the claw at a moment when the former departs from latter to less than 0.2-1 mm.

♪How to adjust L carriage after it was dropped:





The needle stem and the sinker plate
are slightly in contact with each other.

1. Check if L carriage leg is bent.
   Put L carriage into the needle bed and run it under no load. If L carriage is slow to operate, it seems certain that the rear leg is bent so that you will have to straighten it.
   1-1. Although you may use pliers to repair the rear leg, you must be careful not to crack it.
2. Check if the sinker plate of L carriage is bent.
   Determine whether the sinker plate is bent by looking at it from the side.
   If the sinker plate is bent, put L carriage into the needle bed and pull out the needles to the position D I to inspect the clearance between the sinker plate and needle stem. If the needles are being raised by the sinker plate, it seems certain that the sinker plate is bent.

COMPONENT PARTS AND THEIR ACTIONS

Component	Functions
Stitch cam	Acts to push out the needle to let stitches cross the latch of needles and hook new threads to be formed into new stitches by pulling in the needles in order.
Raiser cam	Acts to change paths of the needles at position B in tucking pattern and partial pattern knitting.
Holding cam	Acts to change paths of the needles at position D and E in holding pattern knitting.
Tuck cam	Acts to let stitches cross the latch of needles and hook new threads in tuck pattern knitting.
"MC" cam	Acts to lower the needles at the position D I as they are and form stitches with delivered threads or let the needles arranged at the position B cross the latch to be shifted to the position D I . in multi-color knitting.
Guide cam	Acts to guide the needles on the right courses in various patterns of knitting.
Tension dial	Acts to adjust the position of the stitch cam against the gate pegs and change the size of stitches.
Pattern selector button	Acts to shift the raiser cam or tuck cam to cope with plain, tucking or partial pattern.
"MC" knob	Acts to shift "MC" cam to cope with plain, laying-in or Multi-color pattern.
Holding cam lever	Acts to change the position of the holding cam to cope with holding pattern.
Yarn feeder	Acts to guide threads so as to supply them into hook of the needle surely.
Latch brush	Acts to open the latch of needles surely and press the opened latch so as not to be closed to let threads at the yarn feeder enter inlet hook of the needle and prevents dropping.
Sinker plate	Acts to retain brush wheels and gears so that when the needles are pushed out by the cam, it can prevent stitch floating by pressing stitches.
Stripe adjusting plate	Acts to fix the thread pulling distance of the right and left stitch cams linked with the stitch cam plate.
Needle bed	Acts to guide forward backward movements of needles and determine the well of stitches.
Gate peg	Acts to support previously formed stitches when new ones are formed to help needles form stitches and uniform the size of newly formed stitches to support stitches.
Needle retaining spring	Acts to control the actions of needles and stabilize the needles.

Component	Functions
Needle	Acts to move back and forth due to the action of cams and form stitches due to the action of its hook and latch.
Needle pusher	Acts to constitute pattern with 8 needle pushers combined.
Needle selector button	Acts to raise needle pushers when pressed.
Reverse lever	Acts to take reverse needle selector actions.
Slide dial	Acts to move needle pusher holders laterally and change the needle selection position to knit zigzag pattern.
"MC" change lever	Acts to change the position of needles selected by "MC" change lever and shift the position △ to D I and the position ▼ to D II.
Set lever	Acts to move the needle pusher holder and needles forward when pulled down.
Slide meter	Acts to indicate the position and direction of movement when the tension dial with which it is linked is turned.

■SERVICE GUIDE FOR QUICK TREATMENT

PROBLEMS	CAUSE
• Carriage Jams.	1. Wool not feeding in correctly. 2. Needles bent or needle latches bent. 3. Needle butts were not all in a straight line in one of the 5 positions. (A,B,C, etc.) 4. Insufficient lubrication. 5. Knot in wool caught in yarn feeder.
• Wool breaking or splitting.	1. Poor quality wool. 2. Knots in wool becoming untied. 3. Tension too small.
• Uneven knitting.	1. Wool not feeding in properly. 2. Sinker plate unit loose. 3. Wool uneven or knotted.
• Tight stitches near the edge.	1. Taking carriage too far away from edge of knitting. 2. Tension on the yarn tension unit too tight. 3. Yarn wound too tight.
• Stitches dropped at side.	1. Taking carriage too far. 2. Tension too tight (or too loose) 3. Faulty needle.
• Stitches dropped in center.	1. Latche brushes worn. 2. Faulty needle.
• Plain stitches form even when right & left tuck buttons are depressed. • Tuck stitches form even when plain stitch button is depressed.	1. Raiser cam is not operating properly. 2. Either the raiser cam shift spring or the raiser cam pull spring is unhooked.
• Tuck stitches do not form even when knitting with the tuck buttons depressed. • Fair Isle pattern forms even when knitting with the right and left tuck buttons depressed.	1. Tuck cam is not operating properly. 2. Tuck cam spring is unhooked.

The followings are methods of adjustment for knitting machine and they are divided in three ranks; A, B and C.

Rank "A" is complicated adjustment and this is adjusted by special mechanic of knitting machine.

Rank "B" is simple adjustment and home tutor, teacher in the knitting center or sales man of knitting machine will be able to do it.

Rank "C" is the simplest adjustment and the customers will be able to adjust it themselves or you can advise them how to adjust it by phone.

TREATMENT	RANK	Refer to ...	MEMO
1. Check the path of the wool from the ball through the yarn tension unit.	C	Instruction book.	
2. Replace bent needles.	C		
3. Reset needles.	C		
4. Oil sides of cams and nylon runners beneath carriage.	C		
5. Ease knot through yarn feeder using transfer tool.	C		
1. Use better quality, or wax the wool when winding or knitting.	C		
2. Use reef knot, or weavers knot.	C		
3. Set large tension, on carriage tension dial.	C		
1. Check path of wool and check if ball is not wound too tight.	C		
2. Loosen the thumb screws and push the unit all the way back towards carriage until it lock in. Tighten both thumb screws.	C		
3. Check wool quality.	C		
1. Stop carriage movement immediately after hearing "Click" at end of row.	C		
2. Loosen by turning the dial towards the (—) sign.	C		
3. Check whether yarn comes up from ball freely; if not, wind the yarn again.	C		
1. Stop carriage movement immediately after hearing "Click" at end of row.	C		
2. Set correct tension for yarn used.	C		
3. Replace needle.	C		
1. Replace brushes.	C		
2. Replace needles.	C		
1. If the springs are unhooked, rehook them.	B	Service Manual.	
2. Adjust the position of the lowering cam.	B		
1. If the spring is off the hook, rehook it to the tuck cam pin.	B	S. Manual.	
2. Readjust the tuck cam axle or replace it.	B		

PROBLEMS	CAUSE
• Holding pattern cannot be made. • Even with the holding cam lever at "I", the needles come to position "E".	1. Holding cam lever is making contact with the carriage. 2. The holding cam is making contact with the laying-in cam when the holding cam lever is positioned at "III". 3. The holding cam spring is disconnected.
• Carriage feels stiff when sliding. • Different sliding force is required to move the carriage from left to right and from right to left.	1. Both the carriage and the needle bed need lubrication. 2. Carriage plate and the rear rail of the needle bed are worn by friction. 3. There are scratches on the needle bed or cams. 4. The distance between front & rear foot on the carriage is too narrow.
• In plain stitch knitting, unintended stripes are formed every two rows. • Stripes appear here and there in plain stitch knitting.	1. The thread pulling distance of the right lowering cam is different from that of the left cam. 2. End play of the carriage is too wide. 3. The carriage speed is not uniform. 4. The threads not being fed properly.
• In plain stitch knitting, the stitches sometimes float. • The machine does not knit tucking stitches nor holding stitches.	1. The clearance between the sinker plate assembly and the gate pegs is too wide. 2. The clearance between the sinker plate assembly and the back of needles is too wide.
• Pattern selector buttons do not operate properly. • The pattern selector buttons spring back even when depressed. • The buttons stick. • The raiser cam does not spring up even when part buttons are depressed. • The buttons do not spring dack to normal position even when the plain button is depressed.	1. Button release spring is either distorted or disconnected. 2. Button stopper plate is not operating properly. 3. The raiser cam shifter lever needs re-adjustment.
• Slide dial turns too slowly. • Slide dial turns too fast. • Slide indicator and arrow do not coincide.	1. Needle pusher holder is not operating properly. 2. The slide stopper spring is too loose. 3. Slide scale is not adjusted properly.
• Rotation of reverse lever is too stiff. The reverse needle selection is not performed even when the lever is turned from A to B.	1. There is oil inside of the needle pusher holder. 2. The needle pusher and the needles do not meet at the right instant.

TREATMENT	RANK	Refer to ...	MEMO
1. Adjust so that the holding cam operates smoothly. 2. Adjust the gap between the holding cam and the laying-in cam. 3. Hook the holding cam spring.	B B B	S. Manual.	
1. Clean and lubricate the frictioning position of the carriage. 2. If there are any scratches on the needle butt, needle bed or various cams, repair or replace them. 3. Correct the distance (idle)	C B (A) B	S. Manual, or Inst. book.	
1. Adjust by using stripe adjusting collar. 2. Adjust at the carriage front leg. 3. Judge by the result of the knitted fabric.	B B B	Service Manual.	
1. Correct the clearance.	B	S. Manual.	
1. Repair if the spring is bent and rehook it if it is off the pin. 2. Apply lubricant to the button stopper plate, and if it still does not operate properly, then, replace the pattern selector button unit. 3. In other case, replace the entire selector unit.	B B B	S. Manual.	
1. If the needle pusher is making contact with the stay, adjust the stay and apply lubricant if necessary. 2. Adjust the spring tension of the Slide stop spring. 3. Adjust the graduation of the slide.	B B B	Service Manual.	
1. Disassemble the needle pusher holder and away the oil inside. 2. Adjust the slide stopper spring so that the pusher and the needles meet at the proper instant.	B B	S. Manual.	

PROBLEMS	CAUSE
• The needle selector buttons stick. • The buttons do not return to the original plane even when the release button is depressed. • No needles come out even when the set lever is press down.	1. Needle pusher is not working properly on account of oil inside of the needle pusher holder.
• Needle sticks out suddenly while knitting. • Stitches keep dropping when knitting, especially when making holding pattern.	1. Needle retaining spring is either broken or bent.
• The butts of the selected needles block the cam. • No pattern is formed even when the needles are selected.	1. Position of the selected needles is incorrect.
• The needles corresponding to the pressed buttons do not come out. • No needles come out even when the needle selector buttons are depressed.	1. The needle shanks and the needle pusher do not meet at the right position. (The position of the slide stop spring is incorrect.)
• In knitting lace pattern, the stitches keep hooking on the gate pegs. • Stitches are not uniform.	1. Gate pegs are bent outward too extremely. 2. Gate pegs are bent sideway too extremely.
• The right and left selvedges are different in length although the number of rows knitted is the same.	1. The gate peg unit is not properly installed.
• L carriage is jammed while sliding.	1. Tension dial is not set at the proper position. 2. L carriage is moved without fitting securely into the needle bed. 3. The needles are not in a line.
• In lace pattern knitting, stitches are sometimes hooked on the gate pegs.	1. Tension dial is not set at the proper position 2. The L casriage speed is too fast. 3. Gate pegs are bent.
• Stitches are sometimes hooked on the gate pegs. • Stitches are sometimes dropped when the L carriage is moved from left to right or right to left.	1. Latch of the needle is not working properly. 2. Gate pegs are bent. 3. The position of forwarding claw is not appropriate. 4. The position of leaf spring is not appropriate. 5. Sinker plate of L carriage is distorted.

TREATMENT	RANK	Refer to ...	MEMO
1. Dissassemble the needle pusher holder and wipe off the oil inside.	B	S. Manual.	
1. Replace the needle retaining spring. 2. Repair the needle retaining spring if bent.	A A	S. Manual.	
1. Take the machine from the case and adjust the position of the needle stopper.	B	Service Manual.	
1. Adjust the slide stop spring. 2. Adjust the height of the stay.	B B	S. Manual.	
1. Straighten the bent peg by using the peg bend adjuster. 2. Replace the gate pegs if required.	B A	S. Manual.	
1. Straighten the gate peg unit.	A	Service Manual.	
1. Adjust the position of the tension dial. 2. Press the L carriage softly as operate it. 3. Reset the needles	C C C	S. Manual.	
1. Adjust the position of the tension dial. 2. Operate the L carriage slowly. 3. Repair the gate pegs.	C C B	Service Manual.	
1. Replace the needle. 2. Repair the gate pegs. 3. Adjust the position of the forwarding claw. 4. Adjust the position of the leaf spring. 5. Adjust the sinker plate. 5. Replace the L carriage if required.	C B B B B B B	Instructional book. S. Manual.	

MEMO